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**CHIEF OF ENGINEERS**  
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**WASHINGTON, DC 20310-2600**

DAEN

SUBJECT: The Great Lakes and Mississippi River Interbasin Study - Brandon Road, Will County, Illinois

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress my report on ecosystem protection for controlling upstream transfer of aquatic nuisance species (ANS) from the Mississippi River Basin into the Great Lakes Basin through the Chicago Area Waterway System at Brandon Road Lock and Dam in Will County, Illinois. It is accompanied by the report of the district engineer. These reports partially respond to Section 3061(d) of the Water Resources Development Act (WRDA) of 2007, Public Law 110-114, which directed a feasibility study of the range of options and technologies available to prevent the spread of ANS between the Great Lakes and Mississippi River Basins through the Chicago Sanitary and Ship Canal (CSSC) and other aquatic pathways. The study performed examined ANS transfer from the Mississippi River Basin to the Great Lakes Basin. An additional study would be needed to examine ANS transfer from the Great Lakes Basin to the Mississippi River Basin.
2. The reporting officers recommend authorizing a National Ecosystem Restoration (NER) Plan to protect ecosystems in the Great Lakes Basin by implementing a risk management plan that includes prudent structural measures at Brandon Road Lock and Dam to minimize the risk of upstream transfer and establishment of ANS from the Mississippi River Basin into the Great Lakes Basin. The NER plan addresses Bighead and Silver Carp, the current, greatest Mississippi River Basin ANS threat to the Great Lakes Basin. Bighead and Silver Carp are considered established and abundant in the lower Illinois Waterway (IWW). The nearest detectable Bighead and Silver Carp population is in the Dresden Island Pool, near river mile 280, approximately 6 miles (9.7 kilometers) downstream of Brandon Road Lock and Dam and approximately 47 miles (75.6 kilometers) downstream of Lake Michigan.
3. The Asian Carp Regional Coordinating Committee's (ACRCC's) Monitoring and Response Working Group (MRWG) currently coordinates planning for Asian carp monitoring and control activities within the IWW and Chicago Area Waterways (CAWS). Actions are conducted by state and federal resource management and research agencies, universities, and commercial entities. The U.S. Army Corps of Engineers (Corps) is contributing to this effort through the implementation of a four-pronged strategy, which includes (1) operation of the CSSC-Electric Barriers, (2) conducting studies to evaluate the effectiveness of the CSSC-Electric Barriers, (3) participating in extensive monitoring of the IWW for Asian carp, and (4) the Great Lakes Mississippi River Interbasin Study-Brandon Road (GLMRIS-BR) study to recommend alternatives for controlling upstream transfer through the CAWS. The recommendation to prevent the transfer of ANS from the Mississippi River Basin to the Great Lakes Basin takes into consideration the authorized purposes of the Illinois Waterway, including the needs of its

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multiple users and uses, and is consistent with Executive Order (E.O.) 13112, as amended by E.O. 13751, which directs federal agencies, “to the extent practicable and permitted by law” and subject to funding, administrative, and other requirements, to use their programs and authorities to prevent the spread of invasive species. In particular, E.O. 13112 directs agencies to “refrain from authorizing, funding and implementing actions that are likely to cause or promote the introduction, establishment, or spread of invasive species in the United States unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of establishment will be taken in conjunction with the actions.”

4. The reporting officers recommend authorizing a NER plan to control the upstream transfer of ANS at Brandon Road Lock and Dam with the implementation of ANS nonstructural and structural measures. The structural measures, implemented by the Corps and the non-federal sponsor, include a flushing lock, and within the downstream approach channel of the lock, an engineered channel, acoustic fish deterrent, electric barrier, and air bubble curtain. This subset of the NER plan would be the “Corps Plan”. The nonstructural measures, integral to the NER plan, would be implemented primarily by other federal agencies and include public education and outreach, nonstructural monitoring, integrated pest management, pesticides, manual or mechanical removal, and research and development. Supporting measures including two boat launches. The addition of these nonstructural measures to the Corps Plan represents the NER plan, or “federal plan”. The NER plan will provide ecosystem protection benefits by reducing the risk of Mississippi River Basin ANS establishment in the Great Lakes Basin while minimizing impacts to navigation. The NER plan is expected to have adverse impacts to connectivity of the Des Plaines River and the dispersal of native aquatic species; consequently, mitigation is required. Mitigation is estimated to cost \$7,726,000 million and includes the trapping of native fish species from downstream of the Brandon Road Lock and Dam and transporting them upstream. All practical means to avoid or minimize adverse environmental effects were analyzed and incorporated into the Recommended Plan. Project costs are stated at the October 2018 price level. Equivalent annual costs are based on a 2.875 percent discount rate and a 50-year period of economic evaluation.

5. The State of Illinois is the non-federal sponsor responsible for cost sharing and other responsibilities for implementing the Recommended Plan. Cost sharing for the project is in accordance with the provisions of Section 103 of WRDA 1986, as amended by Section 210 of WRDA 1996. All of the proposed structural measures are located in Will County, Illinois. Based on October 2018 price levels, the estimated project first cost of the NER plan is \$830,784,000. The total project cost includes \$28,749,000 for project monitoring and adaptive management. The Corps share of the structural measures is estimated to be \$540,010,000 (65 percent) and the non-federal share is estimated to be \$290,774,000 (35 percent). The cost of lands, easements, rights-of-way, relocations, and disposal areas (LERRD) for the project is estimated at \$3,312,000, which is below the 35 percent non-federal share of the project cost. The Corps and the state of Illinois as the non-federal sponsor would have split responsibilities for the operations, maintenance, repair, rehabilitation, and replacement (OMRR&R) for the project after construction, at a total equivalent average annual cost of \$8,062,000 per year. The Corps share

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of the OMRR&R equivalent average annual cost, related to operation of the flushing lock, is estimated to be \$28,000. The remaining annual OMRR&R costs are cost shared at \$6,427,000 federal cost and \$1,607,000 non-federal cost in accordance with section 1142 of the Water Resources Development Act of 2018. The total equivalent average annual cost for the nonstructural measures is \$12,323,000 per year.

The implementation of nonstructural measures is a shared responsibility and includes work by the Corps, the non-federal sponsor, and other federal agencies. In the spirit of shared responsibility, the U.S. Fish and Wildlife Service and U.S. Geological Survey will implement or coordinate implementation of nonstructural measures to the extent authorizations and appropriations allow. The Corps share of the nonstructural equivalent average annual cost would be about \$325,000, the non-federal share would be about \$175,000, and while not a project cost, the other federal agencies' share would be about \$11,823,000.

6. The risk reduction performance of the Recommended Plan would provide robustness to the performance of the ANS management and control system within the CAWS. With the implementation of the Recommended Plan, there would be a new control point for Mississippi River Basin ANS at Brandon Road Lock and Dam in addition to the control point that is already provided by the electric dispersal barrier system within the CSSC at Romeoville, Illinois. The technology features making up the NER plan provide a physical deterrent to swimming and floating ANS, while the engineered channel component of the NER plan increases the effectiveness of the structural and nonstructural measures for Asian carp and other ANS. The engineered channel also improves the plan's future adaptability by providing a platform to improve existing technologies and develop and test additional technologies for possible implementation in the future. Nonstructural measures also include monitoring for the presence and movement of ANS within the CAWS to provide information that would be used to maximize the effectiveness of all ANS control efforts. The NER plan protects the Great Lakes Basin, an extensive watershed that includes approximately 5,000 tributaries, more than 1,000 miles of shoreline, and approximately 35,000 islands. The Great Lakes Basin supports over 150 native fish species (including federally and state-listed species), approximately 46 plants and animals that are unique to the basin, and approximately 279 species and habitat types that are documented as globally rare. Cost effectiveness and incremental cost analysis techniques were applied to evaluate the proposed ecosystem protection alternatives to ensure selection of an efficient NER plan to minimize risk of establishment.

7. The NER plan includes a risk informed strategy that utilizes best practices for invasive species management including the development of a layered system of structural technology controls and nonstructural measures that addressed the transport mechanisms of the various life stages of ANS (floating and swimming). Coincident with the development of this layered system of controls, Corps strategy sought to minimize impacts to the uses and users of the IWW from project implementation. A primary use of the IWW is commercial navigation. Risk reduction measures recommended include:

a. Nonstructural Risk Management Controls. The Asian Carp Regional Coordinating Committee's Monitoring & Response Plan would be adapted to account for a new control point

in the IWW. The NER plan includes managing the waterway below Brandon Road as ‘population reduction zone’ where monitoring and overfishing would occur. Between the new control point at Brandon Road Lock and Dam and the CSSC EB, a “monitoring, management and control zone” would be developed. Upstream of the CSSC-EB would be a “monitoring and response zone.” The adaptation and implementation of revised management strategies would be a shared responsibility through work conducted by the ACRCC. Nonstructural measures include public education and outreach, monitoring, integrated pest management, pesticides, manual and mechanical removal, and research and development. The nonstructural measures portion of the plan includes a boat ramp upstream and downstream of Brandon Road Lock and Dam to provide needed access to the waterway for monitoring, overfishing and contingency response actions. Monitoring, maintenance, repair, rehabilitation and response for the structural controls and life-safety response will also be improved with the addition of these boat ramps. Once a control point is implemented within Brandon Road approach channel, ANS risk management of the upper Illinois Waterway and Chicago Area Waterway would be modified to account for a new control point. The Asian Carp Monitoring and Response Plan and the Upper Illinois Waterway Contingency Response Plan would be updated.

b. Engineered Channel. The Brandon Road Lock downstream approach includes a new engineered channel that would increase the effectiveness of the structural and nonstructural ANS control measures installed within it and reduce their impact. An engineered channel would provide a smooth surface environment where underwater monitoring would be improved over the current conditions of the Brandon Road approach channel. With a smooth surface, fish and other ANS would have fewer places to hide from monitoring and would be less sheltered from ANS controls. After maintenance or malfunction of ANS controls, a smooth channel also would allow nets to hug channel sides, improving the effectiveness and efficiency of fish clearing. Recessing ANS controls into the channel bottom protects them from debris exiting the lock, objects dragged by vessels across the channel floor, and propeller projectiles. Power and supply lines would run within the channel walls to protect them from vessel impact. In areas surrounding the electric barrier, the engineered channel walls and floor would contain electrical insulation. The insulation would minimize stray current within the channel, including upstream, downstream, and outside the channel.

c. Electric Barrier. An electric barrier within the engineered channel is recommended to reduce the risk of ANS passage through the lock. As the duration the electric barrier is on increases, the effectiveness of the Brandon Road control point also increases. By minimizing stray current, other ANS controls can be clustered around the electric barrier at the downstream end of the approach channel. The box shaped engineered channel also provides a uniform water depth, which positively impacts the effectiveness of electricity, bubbles and sounds. Providing for electric insulation in the engineered channel allows the electric barrier to reduce the life safety risk to vessel operators and lock staff and helps reduce corrosion rates in surrounding infrastructure composed of or containing metal. By minimizing stray current, the likelihood increases that the Brandon Road electric barrier would be on for longer periods of time, such as

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when vessels are within the lock or are staged immediately downstream, along the right descending bank long wall.

d. Acoustic Fish Deterrent. An acoustic fish deterrent within the engineered channel is recommended to address swimming ANS by deterring fish from entering the engineered channel. This ANS control feature also would provide a secondary fish deterrent when there is no electricity in the water during vessel transit. The acoustic fish deterrent includes two speaker arrays. The first array's goal is to deter fish from entering the channel and deflect to the pool of water below the Brandon Road Dam. The second array is wider to ensure strong swimmers would not swim through the entire sound field without having a chance to change direction.

e. Air Bubble Curtain. An air bubble curtain is recommended to remove ANS floaters and small swimmers from the protected gaps formed between vessels. If an ANS are within these protected pools of water then the ANS may be transferred past the electric barrier or acoustic fish deterrent, and control point effectiveness would be reduced.

8. The implementation strategy for the NER plan would reduce the risk of ANS transfer and establishment through a series of risk reduction increments that either could be implemented simultaneously, where the entire project is implemented in an expedited manner and the ANS controls are then activated together, or implemented sequentially, where ANS controls are activated on a rolling basis. The project first cost for a sequential implementation is \$830,784,000.

a. Initial Risk Reduction. Nonstructural Measures. Once the project was authorized and funded, nonstructural measures could begin immediately. Nonstructural measures, estimated to equal \$11,823,000 per year, would be conducted by other federal agencies consistent with their shared responsibility for purposes served by federal plan. Nonstructural measures equal to \$500,000 per year would be a project cost. These nonstructural measures are vital to maximizing the risk reduction provided by the Brandon Road control point, and the entire managed system increases.

b. Risk Reduction Increment 1. The combined technology measures for the first increment include an incremental portion of the engineered channel, the air bubble curtain, narrow speaker array for the acoustic fish deterrent, and upstream boat ramps. The excavation of the entire engineered channel would be completed during this time to minimize navigation impacts. The property along the right descending bank would also be prepared to provide for storage and processing of blasted rock. The facility support building would be constructed. The air bubble curtain addresses fish entrainment and the acoustic array is a swimmer deterrent. These features are at the end of the channel to deflect the fish from entering the channel and instead direct them to the dam. The project first cost of Risk Reduction Increment 1 is \$205,700,000.

c. Risk Reduction Increment 2. The second increment of combined technology measures include installation of the electric barrier, wide speaker array for the acoustic fish deterrent, the

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associated portion of the engineered channel for these measures, and the flushing lock. The engineered channel wall on the right descending bank would be constructed to connect with the already constructed portions of the engineered channel. The facility support building would be completed. The acoustic and electric barriers would act as deterrents for the swimmer life stages. The flushing lock provides a floater deterrent by replacing water from the lower pool with water from the upper pool. The project first cost of Risk Reduction Increment 2 is \$534,945,000.

d. Risk Reduction Increment 3. The third increment would complete the engineered channel. The left descending bank wall would be constructed to extend to the end of the lock's short left descending bank wall. The floor to the engineered channel upstream of the wide acoustic speaker array would also be completed. The engineered channel increases the efficiency of monitoring for project effectiveness and fish clearing and provides as area for future ANS testing and possible installation. The project first cost of Risk Reduction Increment 3 is \$90,139,000.

As risk reduction elements are constructed, ANS risk management strategies of the upper IWW and CAWS would be adapted to include these new features at the Brandon Road control point. The development of revised management strategies would be a shared responsibility through work conducted by the Asian Carp Regional Coordinating Committee and in particular the Monitoring and Response Working Group, which is composed of field biologists and researchers familiar with Asian carp in the Illinois Waterway.

9. The annual OMRR&R of the Corps plan is estimated to be \$8,062,000 per year. The annual \$28,000 OMRR&R cost for the flushing lock would remain a Corps cost because the flushing lock is intricately tied to operating of the lock for its navigation purpose. The remaining annual OMRR&R costs are cost shared at \$6,427,000 federal cost and \$1,607,000 nonfederal cost in accordance with section 1142 of the Water Resources Development Act of 2018.

10. Residual Risk. The transport or dispersal of ANS outside of the aquatic pathway is considered a residual risk for the GLMRIS-BR plan and there is uncertainty associated with the NER plan's ability to control ANS transfer through the CAWS. Even though the NER plan includes known technologies and engineering concepts, they are being applied for new purposes, to control the transfer of ANS, in a unique navigation environment. The combination of technologies and application of the technologies at a single control point would be implemented for the first time under the Recommended Plan and could impact the plans effectiveness. To address navigation operation risk concerns, the proposed upstream and downstream boat launch designs will consider life safety factors so that these two features can be implemented and operated without increasing safety risks to mariners within the area. And once constructed, the Corps and the U.S. Coast Guard will conduct an evaluation of the operation of the electric dispersal barrier, acoustic fish deterrent, and air bubble curtain, all within an engineered channel, to assess safe operating parameters for each measure as well the potential need for a regulated navigation area.

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11. In accordance with the current Engineer Circular (EC) on review of decision documents, all technical, engineering and scientific work underwent an open, dynamic and vigorous review process to ensure technical quality. This included an Agency Technical Review (ATR), a Type I Independent External Peer Review (IEPR), and USACE Headquarters policy and legal review. All concerns of the ATR have been addressed and incorporated into the final feasibility report. The Corps conducted the IEPR in accordance with Section 2034 of the Water Resources Development Act of 2007, USACE EC 1165-2-217, and the Office of Management and Budget's Final Information Quality Bulletin for Peer Review (2004). The National Ecosystem Restoration Planning Center of Expertise (ECO-PCX) coordinated the IEPR, which the review panel identified and documented 13 final comments. Of these, two were designated as having medium-high significance, four as having medium significance, five as having medium-low significance, and two as having low significance. All IEPR review comments have been resolved and resulted in no significant changes to the plan formulation, engineering assumptions, and environmental analyses that supported the decision-making process and plan selection. The final report and environmental impact statement also underwent state and agency review. All comments from the above referenced reviews have been addressed and incorporated into the final documents as appropriate. Overall, the reviews did result in improvements to the technical clarity and overall quality of the report. A safety assurance review (Type II IEPR) of the project may be conducted during the design phase.

12. Washington level review indicates that the project recommended by the reporting officers is technically sound, environmentally and socially acceptable, and cost effective. The plan complies with all essential elements of the U.S. Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies and complies with other administrative and legislative policies and guidelines. Also, the views of interested parties, including federal, state, and local agencies have been considered.

13. I generally concur with the findings, conclusions, and recommendations of the reporting officers. Accordingly, I recommend that the plan to control upstream transfer of aquatic nuisance species from the Mississippi River Basin into the Great Lakes Basin through the Chicago Area Waterway System at Brandon Road Lock and Dam in Will County, Illinois be authorized in accordance with the reporting officers' Recommended Plan at an estimated cost of \$830,784,000 for structural measures and an \$12,323,000 equivalent average annual cost for nonstructural measures with such modifications as in the discretion of the Chief of Engineers may be advisable. My recommendation is subject to cost sharing, financing, and other applicable requirements of federal and state laws and policies, including Section 103 of WRDA 1986, as amended, 33 U.S.C. § 2213. The non-federal sponsor, the state of Illinois, would provide the non-federal cost share and all LERRDs. Further, the non-federal sponsor would be responsible for a portion of the OMRR&R. This recommendation is subject to the non-federal sponsor agreeing to comply with all applicable federal laws and policies, including but not limited to:

- a. Provide 35 percent of total project costs as further specified below:

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1) Provide 35 percent of design cost in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;

2) Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material; perform or ensure the performance of all relocations; and construct all improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material, all as determined by the government to be required or to be necessary for the construction, operation, and maintenance of the project, and all in compliance with applicable provisions of the Uniform Relocation and Assistance and Real Property Acquisition Policies act of 1970, as amended (42 U.S.C. 4601-4655) and the regulations contained in 49 C.F.R. Part 24;

3) Provide, during construction, any additional funds necessary to make its total contribution equal to 35 percent of total project costs;

b. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments), such as any new developments on project lands, easements, and rights-of-way or the addition of facilities that might reduce the outputs produced by the project, hinder operation and maintenance of the project, or interfere with the project's proper function;

c. Not use the project or lands, easements, and rights-of-way required for the project as a wetlands bank or mitigation credit for any other project;

d. For so long as the project remains authorized, provide 20 percent of costs allocated to operation, maintenance, repair, rehabilitation, and replacement of the project (with the exclusion of such costs allocated to the flushing lock), or functional portions of the project, including any mitigation features, to the federal government;

e. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, rehabilitation, and replacement of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors;

f. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 95-510, as amended (42 USC §§9601–9675), that may exist in, on, or under lands, easements, or rights-of-way that the federal government determines to be required for construction, operation, and maintenance of the project. However, for lands that the federal government determines to be subject to the navigation servitude, only the federal government shall perform such investigations unless the federal government provides the non-federal sponsor with prior specific written direction,



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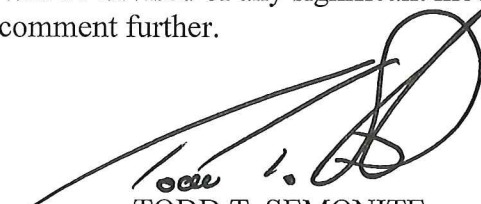
in which case the non-federal sponsor shall perform such investigations in accordance with such written direction;

g. Assume, as between the federal government and the non-federal sponsor, complete financial responsibility for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that the federal government determines to be required for construction, operation, and maintenance of the project;

h. Agree, as between the federal government and the non-federal sponsor, that the non-federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, repair, rehabilitate, and replace the project in a manner that will not cause liability to arise under CERCLA; and

14. The recommendation contained herein reflects the information available at this time and current departmental policies governing formulation of individual projects. It does not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program or the perspective of higher review levels within the executive branch. Consequently, the recommendation may be modified before it is transmitted to Congress as a proposal for authorization and implementation funding. However, prior to transmittal to Congress, the sponsors, the state of Illinois, interested federal agencies, and other parties will be advised of any significant modifications and will be afforded an opportunity to comment further.

TO VERY HONORED  
CHIEF'S APPROVE THIS  
THE CORP'S REPORT FOR ONE OF  
PROJECTS! WE ARE MOST IMPORTANT  
COMMITTED TO REMOVE THE  
RISK OF ASIAN CRAP!!

  
TODD T. SEMONITE  
Lieutenant General, USA  
Chief of Engineers